

Exhibit O



City of Madison

ELECTRICAL**Permit****Building Inspection Division**

126 South Hamilton St
P.O. Box 2984
Madison WI 53701-2984
Phone (608)266-4551
Fax (608)266-6377

Property located at: 201 S GAMMON RD	Permit date: 08/13/2018	Permit number: BLDELE-2018-11184
Owner name MADISON METRO SCHOOL DIST	Owner mailing address 545 W DAYTON ST MADISON, WI 53703	

Contractor Name: FORWARD ELECTRIC INC	License holder number 252204
Contractor Mailing address 6909 RAYWOOD RD MADISON, WI 53713	Phone (608) 221-1945 jennifer@forwardelectric.com

This permit is issued for execution of the work indicated. It is hereby agreed that all work will be installed in accordance with all City of Madison Ordinances and department rules relating to such work.

TYPE OF BUILDING: **COMMERCIAL**
PROJECT DESC: **NEW LIGHTING FOR FOOTBALL AND BASEBALL FIELDS**
NATURE OF JOB: **REPAIR/ALTERATION**

EXISTING BUILDING

(Number of Openings Added) (Includes: Convenience Outlets, Switches, Fixture, Fixed Appliances, etc.)

Minimum fee \$15.00

\$2.00 per opening for the first 20 openings, plus

\$1.50 per opening for the additional 21-40 openings, plus

\$1.00 per opening for the additional 41-99 openings, plus

\$0.50 per opening for all openings over 100.

FEES:**Item Description**

Number of Openings Added or Moved

Units

15

Fee

30.00

TOTAL INSPECTION FEES: 30.00

Inspector Assigned

James Ruetten
608-266-4554
jruetten@cityofmadison.com

ElectricalPermit_20180813_133020.pdf - (Read-Only)

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City of Madison

ELECTRICAL

Permit

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Contractor Name: FORWARD ELECTRIC INC	License holder number 252204
Contractor Mailing address 6909 RAYWOOD RD	Phone (608) 221-1945



City of Madison Site Plan Verification

PROJECT: LNDSPR-2018-00101

Address: 201 S Gammon RD

Current Revision #: 0

Submitted by: Forward Electric

Contact: Jenn Luhman
(608) 221-1945
jennifer@forwardelectric.com

Project Type: Permitted Use Site Plan Review

Description: Updating lighting for Memorial High School's football and baseball fields

Status: Approved

Revision History: 0

Review	Status	Reviewer	Reviewed
Lighting Review	Approved	Steve Rewey	Aug 2 2018
Urban Design Commission Review	Approved	Janine Glaeser	Aug 6 2018
Zoning Review	Approved	Christina Thiele	Jul 31 2018

URBAN DESIGN COMMISSION

Note

Comment Date: 08/06/2018

Building Plan review team to confirm no light trespass and full light cut-off fixtures.

ZONING

Supplement Accepted

Comment Date: 07/30/2018

Submit \$50 site plan review fee. Checks are made out to City of Madison.

Supplement Accepted

Comment Date: 07/30/2018

Per Section 28.186(4)(b), the property owner or operator is required to bring the property into compliance with all elements of the approved site plans by the date established by the Zoning Administrator as part of the site and building plan approval. Work with Zoning staff to establish a final site compliance date.

****Applicant provided the date 9/1/18****

Wind Design Criteria: IBC STD 2009 90MPH Exposure C

Lighting Equipment

PROJECT		DATE	
50 Fe		2/24/18	
FIELD		REVISIONS	
163423-P-FB		405724	
POLE		LUMINAIRES	
QUANTITY	LOCATION	TYPE	AMOUNT
1	F1	TLC-BT-575 2	1.15 1.15
1	F2	TLC-BT-575 2	1.15 1.15
1	F3	TLC-BT-575 2	1.15 1.15
1	F4	TLC-BT-575 2	1.15 1.15
TOTALS		56	58.30

Overcurrent devices and conductors MUST be sized using the Manufacturer's rated ampere draw per luminaire (AW). Using the kW rating can result in undersized calculations. Refer to Musco's Control System Summary or Specification Chart (located below) for manufacturer's ampere draw.

DRIVER SPECIFICATIONS		VOLTAGE: 480V		3 PHASE	
TLC-LED-1160 MAX WATT	208	230	240	277	347
Per LED Luminaire	6.03	6.46	6.18	5.92	5.13

DRIVER SPECIFICATIONS		VOLTAGE: 480V		3 PHASE	
TLC-LED-575 MAX WATT	208	230	240	277	347
Per LED Luminaire	3.17	3.00	2.87	2.75	2.39

DRIVER SPECIFICATIONS		VOLTAGE: 480V		3 PHASE	
TLC-LED-400 MAX WATT	208	230	240	277	347
Per LED Luminaire	2.31	2.18	2.09	2.00	1.73

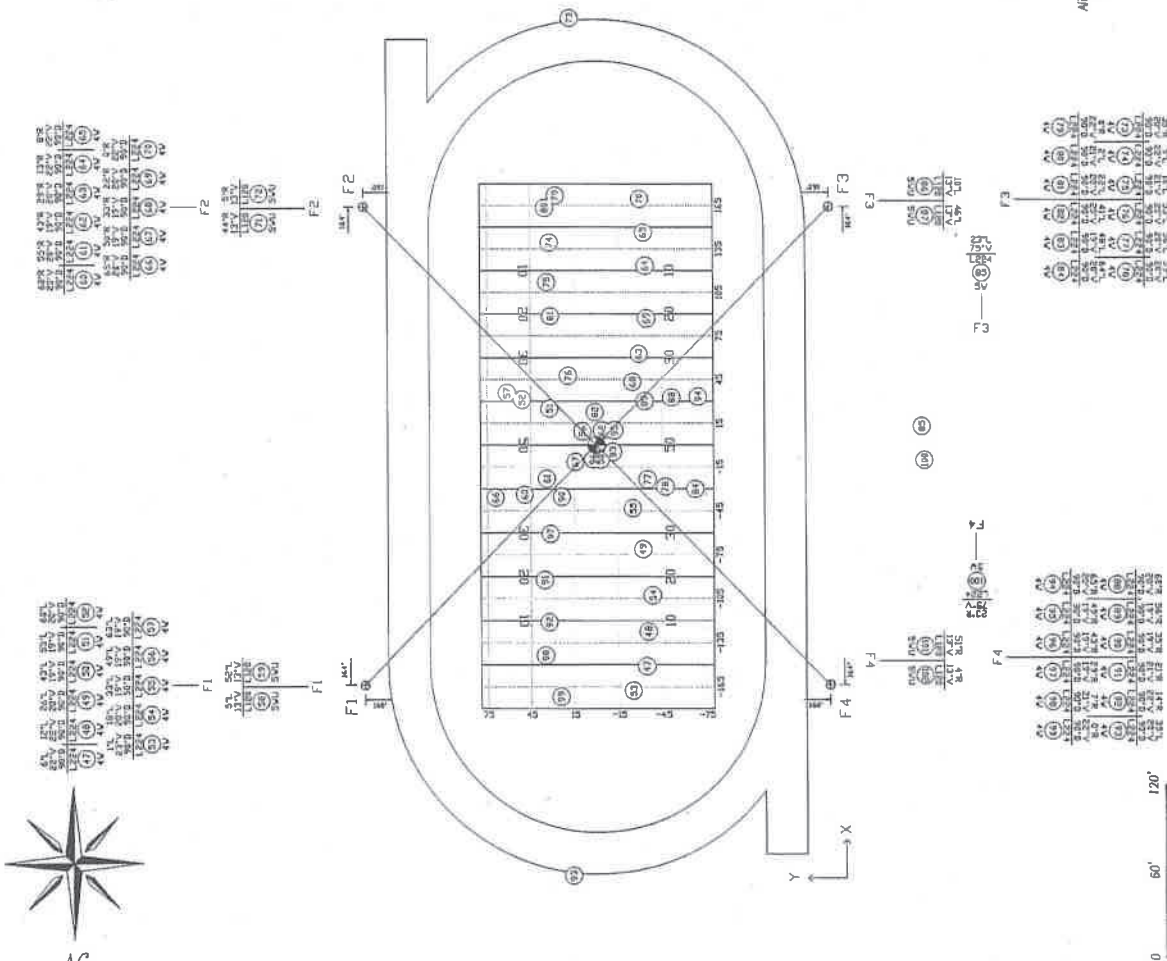
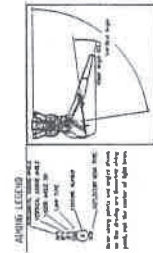
Pole Laser Aiming Points		Field Name	
ID	Y	F1	F2
F1	Pole	0	0
F2	Pole	0	0
F3	Pole	0	0
F4	Pole	0	0

If you have questions pertaining to this document, please contact DONOR RAULF, your project engineer.
Phone: 800-255-6825 ext: 21531
DATE: 05/22/18

The following poles ECE's will have spore fuses: F3

This symbol represents the 0.0 point for locating poles.
This field uses a 30' x 30' grid.

FIELD ID: Football



SCALE: 1 inch = 60'

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Madison Memorial High School

Madison, WI

Lighting System

Pole / Fixture Summary					
Pole ID	Pole Height	Mtg Height	Fixture Qty	Luminaire Type	Load
F1-F2	80'	15'	2	TLC-BT-575	1.15 kW
		80'	11	TLC-LED-1150	12.65 kW
F3-F4	80'	15'	2	TLC-BT-575	1.15 kW
		80'	12	TLC-LED-1150	13.80 kW
		50'	1	TLC-LED-400	0.40 kW
4			56		58.30 kW

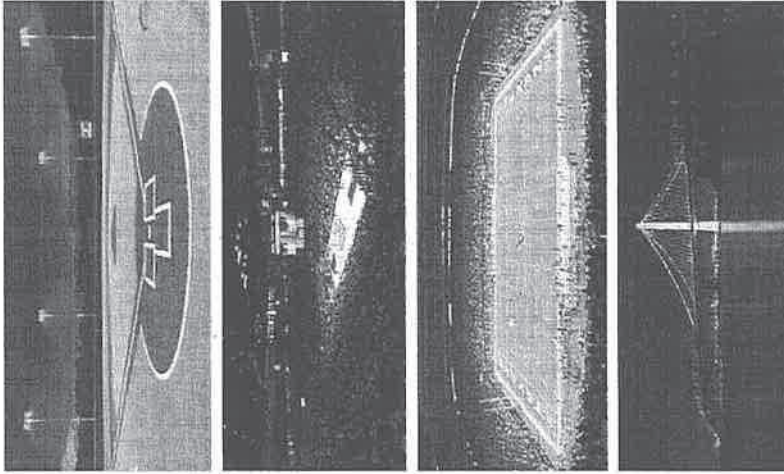
Circuit Summary			
Circuit	Description	Load	Fixture Qty
A	Football	58.3 kW	56

Fixture Type Summary					
Type	Source	Wattage	Lumens	L90	Quantity
TLC-LED-1150	LED 5700K - 75 CRI	1150W	121,000	>63,500	46
TLC-BT-575	LED 5700K - 75 CRI	575W	52,000	>63,500	8
TLC-LED-400	LED 5700K - 75 CRI	400W	38,600	>63,500	2

Light Level Summary

Calculation Grid Summary									
Grid Name	Calculation Metric	Ave	Min	Max	Max/Min	Ave/Min	Circuits	Fixture Qty	
Bleachers	Horizontal	4.60	0	14	62.20		A	56	
Football	Horizontal Illuminance	50.8	41	62	1.50	1.24	A	56	
Soccer	Horizontal Illuminance	51	41	63	1.56	1.24	A	56	
Track	Horizontal Illuminance	16.3	0	44	205.30		A	56	

From Hometown to Professional

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PROJECT SUMMARY

ENGINEERED DESIGN By: Connor Ramstead • File #163423-p-FB • 23-May-18

Madison Memorial High School

Madison, WI

GRID SUMMARY

Name: Football
Size: 360' x 160'
Spacing: 30.0' x 30.0'
Height: 3.0' above grade

ILLUMINATION SUMMARY

MAINTAINED HORIZONTAL FOOTCANDLES

Entire Grid

Guaranteed Average: 50

Scan Average: 50.77

Maximum: 62

Minimum: 41

Guaranteed Max / Min: 1.23

Avg / Min: 2

Max / Min: 1.50

UG (adjacent pts): 1.29

CU: 0.54

No. of Points: 72

ILLUMINANCE INFORMATION

Color / CRI: 5700K - 75 CRI

Luminaire Output: 121,000 / 52,000 / 38,600 lumens

No. of Luminaires: 56

Total Load: 58.3 kW

Luminaire Type

L70 hrs

L80 hrs

L90 hrs

L95 hrs

L98 hrs

L99 hrs

L100 hrs

L105 hrs

L110 hrs

L115 hrs

L120 hrs

L125 hrs

L130 hrs

L135 hrs

L140 hrs

L145 hrs

L150 hrs

L155 hrs

L160 hrs

L165 hrs

L170 hrs

L175 hrs

L180 hrs

L185 hrs

L190 hrs

L195 hrs

L200 hrs

L205 hrs

L210 hrs

L215 hrs

L220 hrs

L225 hrs

L230 hrs

Guaranteed Performance: The ILLUMINATION described above is guaranteed per your Musco Warranty document and includes a 0.95 dirt depreciation factor.

Field Measurements: Individual field measurements may vary from computer-calculated predictions and should be taken in accordance with IESNA RP-6-15.

Electrical System Requirements: Refer to Amperage Draw Chart and/or the "Musco Control System Summary" for electrical sizing.

Installation Requirements: Results assume $\pm 3\%$ nominal voltage at line side of the driver and structures located within 3 feet (1m) of design locations.

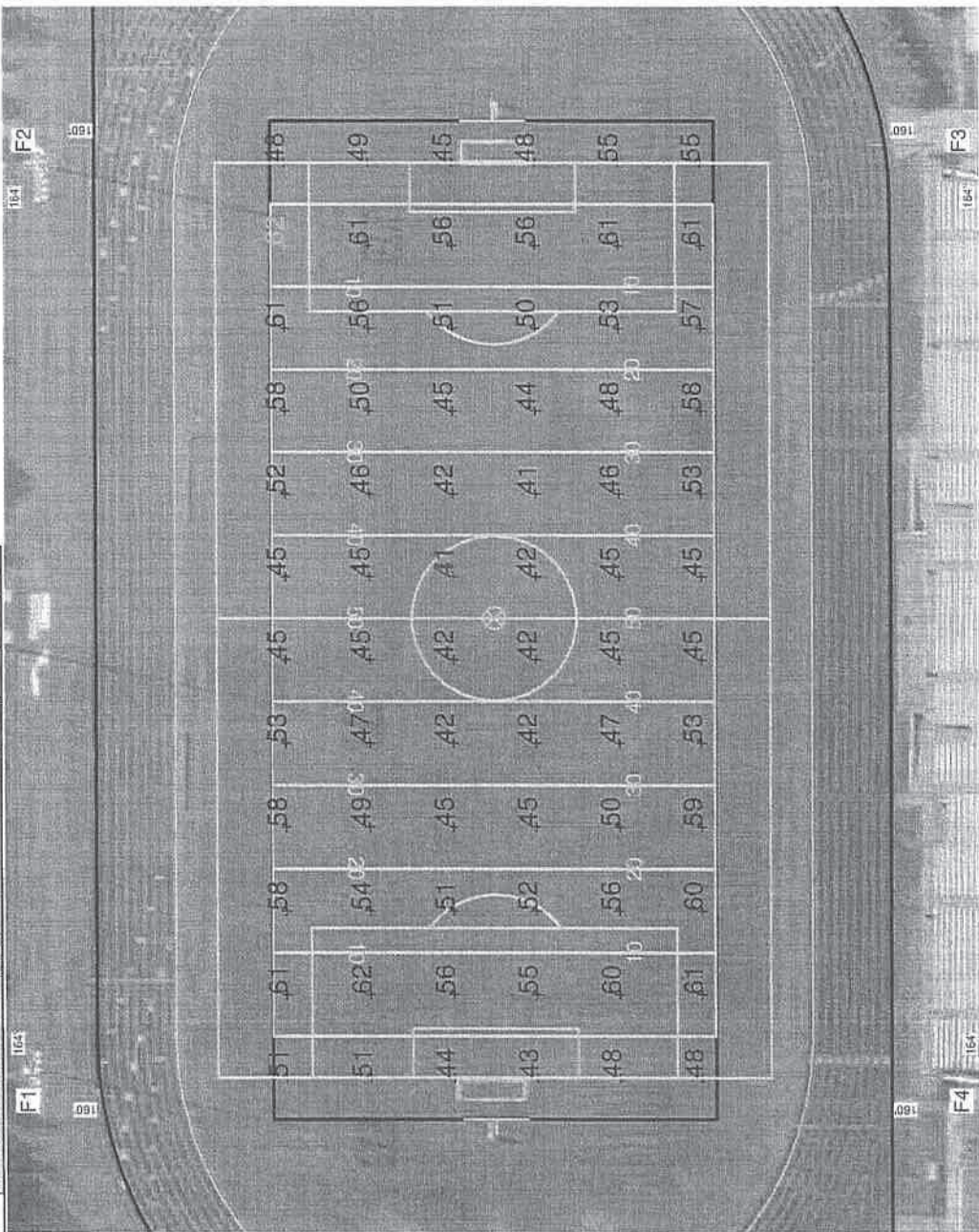


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ILLUMINATION SUMMARY

EQUIPMENT LIST FOR AREAS SHOWN									
Pole		Luminaires							
QTY	LOCATION	SIZE	GRADE ELEVATION	MOUNTING HEIGHT	LUMINAIRE TYPE	QTY	THIS GRID	OTHER GRIDS	
2	F1-F2	80'		15'	TLC-BT-575	2	2	0	
				80'	TLC-LED-1150	11	11	0	
2	F3-F4	80'		15'	TLC-BT-575	2	2	0	
				50'	TLC-LED-400	1	1	0	
				80'	TLC-LED-1150	12	12	0	
4					TOTALS	56	56	0	



Pole location(s) dimensions are relative to 0,0 reference point(s)

SCALE IN FEET 1 : 60



ENGINEERED DESIGN By: Connor Ramstead • File #163423-p-FB • 23-May-18

Madison Memorial High School

Madison, WI

GRID SUMMARY

Name: Soccer
Size: 330' x 200'
Spacing: 30.0' x 30.0'
Height: 3.0' above grade

ILLUMINATION SUMMARY**MAINTAINED HORIZONTAL FOOTCANDLES**

Entire Grid

Guaranteed Average: 50
Scan Average: 50.99
Maximum: 63
Minimum: 41
Avg / Min: 1.25
Guaranteed Max / Min: 2
Max / Min: 1.56
UG (adjacent pts): 1.33
CU: 0.64
No. of Points: 84

LUMINAIRE INFORMATION

Color / CRI: 5700K - 75 CRI
Luminaire Output: 121,000 / 52,000 / 38,600 lumens
No. of Luminaires: 56
Total Load: 58.3 kW

Luminaire Type	150 hrs	180 hrs	170 hrs
TLC-LED-1150	>63,500	>63,500	>63,500
TLC-BT-575	>63,500	>63,500	>63,500
TLC-LED-400	>63,500	>63,500	>63,500

Reported per TM4.2.11. See luminaire datasheet for details.

Guaranteed Performance: The ILLUMINATION described above is guaranteed per your Musco Warranty document and includes a 0.95 dirt depreciation factor.

Field Measurements: Individual field measurements may vary from computer-calculated predictions and should be taken in accordance with IESNA RP-6-15.

Electrical System Requirements: Refer to Amperage Draw Chart and/or the "Musco Control System Summary" for electrical sizing.

Installation Requirements: Results assume \pm 3% nominal voltage at line side of the driver and structures located within 3 feet (1m) of design locations.

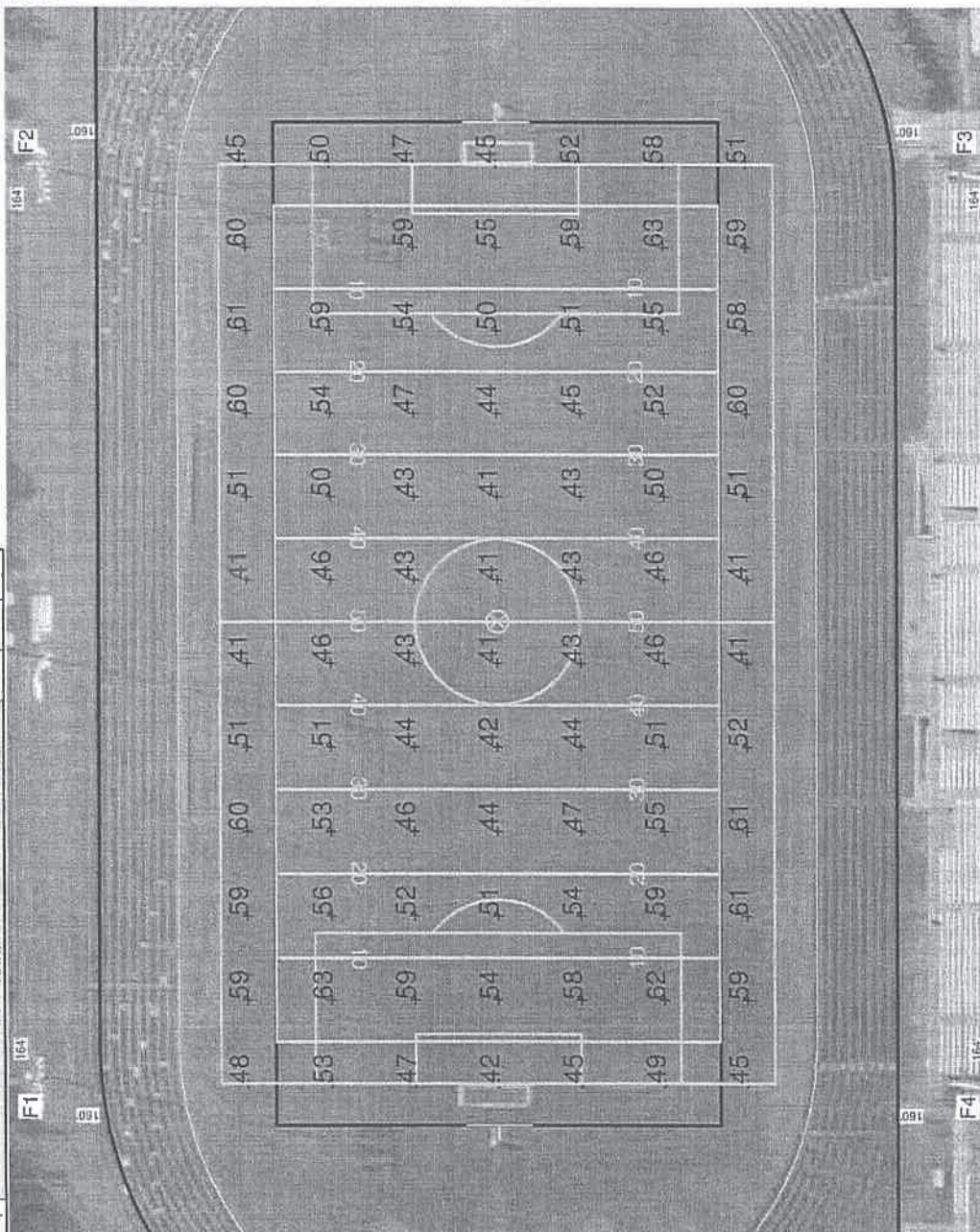


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ILLUMINATION SUMMARY**EQUIPMENT LIST FOR AREAS SHOWN**

QTY	LOCATION	SIZE	GRADE ELEVATION	MOUNTING HEIGHT	Luminaires			
					LUMINAIRE TYPE	QTY / POLE	THIS GRID	OTHER GRID
2	F1-F2	80'	-	15'	TLC-BT-575	2	2	0
				80'	TLC-LED-1150	11	11	0
2	F3-F4	80'	-	15'	TLC-BT-575	2	2	0
				50'	TLC-LED-400	1	1	0
				80'	TLC-LED-1150	12	12	0
4					TOTALS	56	56	0



Madison Memorial High School

Madison, WI

GRID SUMMARY

Name: Track
Size: Irregular
Spacing: 30.0' x 30.0'
Height: 3.0' above grade

ILLUMINATION SUMMARY

MAINTAINED HORIZONTAL FOOTCANDLES

Entire Grid

Scan Average: 16.34

Maximum: 44

Minimum: 0

Avg / Min: 76.92

Max / Min: 205.30

UG (adjacent pts): 0.00

CU: 0.12

No. of Points: 50

ILLUMINANCE INFORMATION

Color / CRI: 5700K - 75 CRI

Luminaire Output: 121,000 / 52,000 / 38,600 lumens

No. of Luminaires: 56

Total Load: 58.3 kW

Reported per Table 2.1.1. See luminaire datasheet for details.

Luminaire Type	150 hrs	180 hrs	170 hrs
TLC-LED-1150	>63,500	>63,500	>63,500
TLC-BT-575	>63,500	>63,500	>63,500
TLC-LED-400	>63,500	>63,500	>63,500

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Field Measurements: Individual field measurements may vary from computer-calculated predictions and should be taken in accordance with IESNA RP-6-15.

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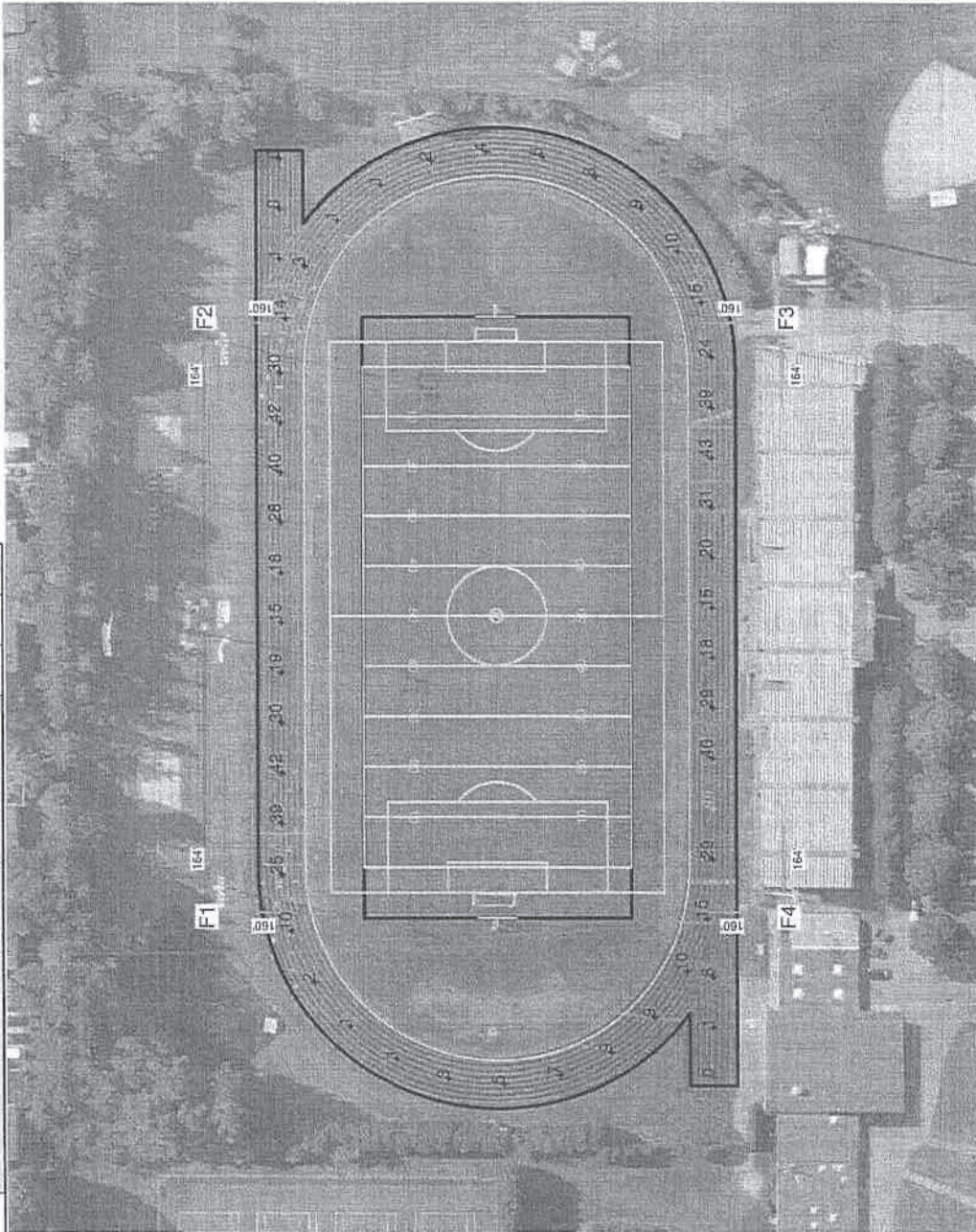


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ILLUMINATION SUMMARY

EQUIPMENT LIST FOR AREAS SHOWN					
QTY	LOCATION	Pole		Luminaires	
		SIZE	GRADE ELEVATION	TYPE	QTY / POLE
2	F1-F2	80'	15'	TLC-BT-575	2
2	F3-F4	80'	15'	TLC-LED-1150	11
2		80'	50'	TLC-BT-575	2
2		80'	50'	TLC-LED-400	1
4				TLC-LED-1150	32
TOTALS					56
					56
					0



Pole location(s) dimensions are relative to 0,0 reference point(s)

SCALE IN FEET 1 : 100



ENGINEERED DESIGN By: Connor Ramstead • File #163423-p-FB • 23-May-18

Madison Memorial High School

Madison, WI

EQUIPMENT LAYOUT

INCLUDES:

- Football
- Soccer
- Track

Electrical System Requirements: Refer to Amperage Draw Chart and/or the "Musco Control System Summary" for electrical sizing.

Installation Requirements: Results assume $\pm 3\%$ nominal voltage at line side of the driver and structures located within 3 feet (1m) of design locations.

EQUIPMENT LIST FOR AREAS SHOWN

QTY	LOCATION	SIZE	GRADE ELEVATION	MOUNTING HEIGHT	Luminaires		
					LUMINAIRE TYPE	QTY	POLE
2	F1-F2	80"		15'	TLC-BT-575	2	2
				80'	TLC-LED-1150	11	11
2	F3-F4	80"		15'	TLC-BT-575	2	2
				50'	TLC-LED-400	1	1
				80'	TLC-LED-1150	12	12
4	TOTALS					56	56

SINGLE LUMINAIRE AMPERAGE DRAW CHART

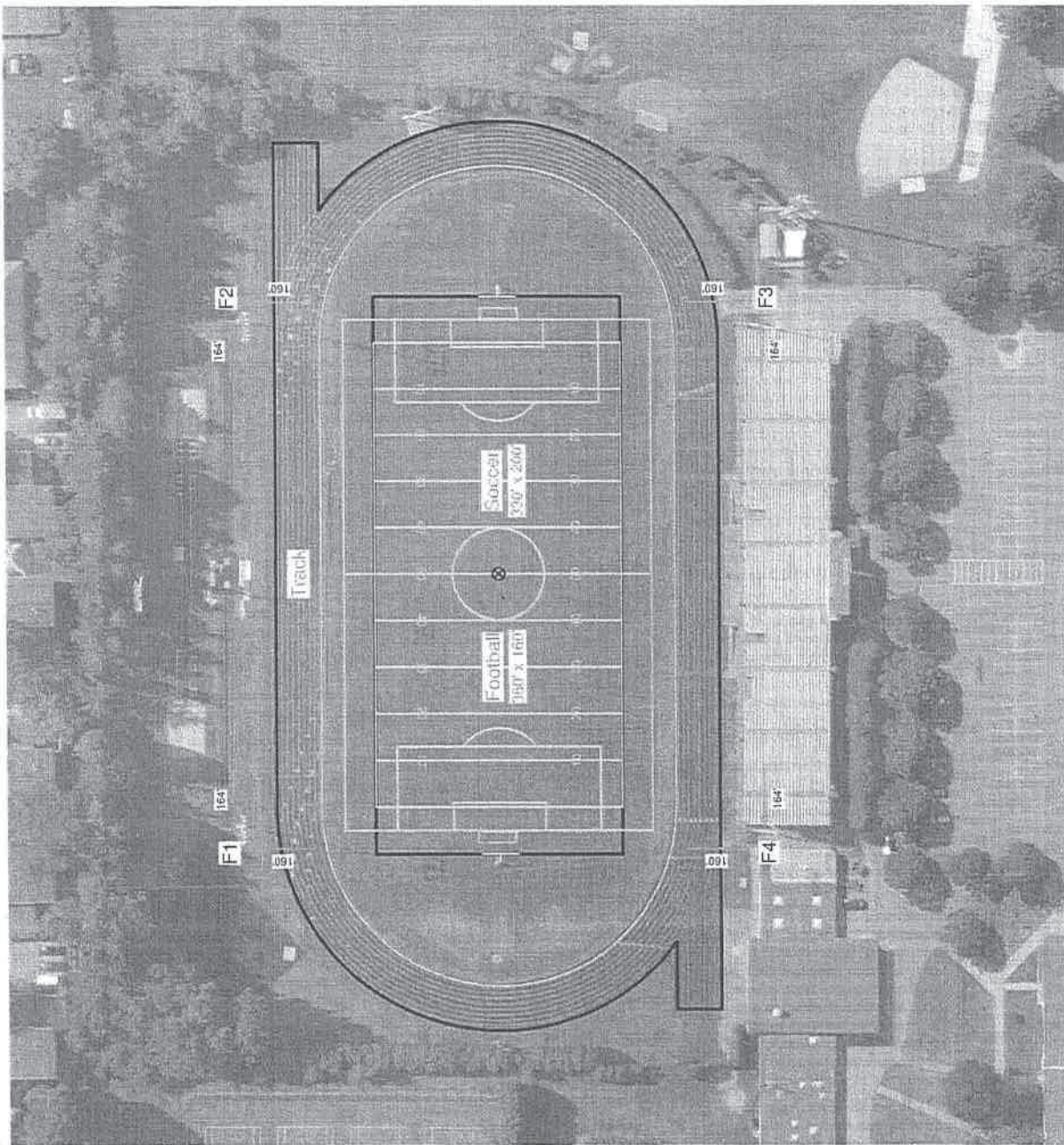
Ballast Specifications (40 min power factor)		Line Amperage Per Luminaire (max draw)	
Single Phase Voltage		220	240
		(60)	(60)
TLC-LED-1150	6.8	6.5	5.9
TLC-BT-575	3.2	3.0	2.8
TLC-LED-400	2.5	2.3	2.1
		1.9	1.5
		1.4	1.1



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EQUIPMENT LAYOUT



Pole location(s) Φ dimensions are relative to 0,0 reference point(s) \otimes

SCALE IN FEET 1" = 100'



ENGINEERED DESIGN By: Connor Ramstead • File #163423-p-FB • 23-May-18

Wind Design Criteria: IBC STD 2009 90MPH Exposure C

Lighting Equipment

PROJECT		DATE				
50/30 Fc		163423 - p - SBI				
2.1/2.1		406773				
PALE QUANTITY	PALE LOCATION	MOUNTING HEIGHT	PALE SIZE	LUMINAIRE		ATTACHMENT
				TYPE	WATTAGE	
1	A1	90'	80"	1500W AZ	6	8.35
1	A2	90'	80"	1500W AZ	6	9.36
1	B1	80'	80"	1500W AZ	10	15.60
1	B2	80'	80"	1500W AZ	10	15.60
1	C1	80'	80"	1500W AZ	4	6.24
1	C2	80'	80"	1500W AZ	4	6.24
1	D1	80'	80"	1500W AZ	3	4.68
1	D2	80'	80"	1500W AZ	3	4.68
TOTALS				46	71.76	

Overcurrent devices and conductors MUST be sized using the Manufacturer's rated ampere draw per luminaire (WA). Using the AW rating can result in undersized calculations. Refer to Musco's Control System Summary or Specification Chart (located below) for manufacturer's ampere draw.

BALLAST SPECIFICATIONS		VOLTAGE: 480V		3 PHASE	
SINGLE PHASE VOLTAGE		208/220/240		277/347/380	
1500 WATT METAL HALIDE LAMP	8.6	8.3	7.7	7.5	5.1
1000 WATT METAL HALIDE LAMP	6.5	6.4	5.9	5.8	4.9
400 WATT METAL HALIDE LAMP	3.2	3.1	2.9	2.8	2.4

Field Name		Pole		Laser Aiming Points	
		I.D.	I.D.	X	Y
Baseball		A1	Pole	0	0
		A2	Pole	0	0
		B1	Pole	0	0
		B2	Pole	0	0
		C1	Pole	0	0
		C2	Pole	0	0
		D1	Pole	0	0
		D2	Pole	0	0

If you have questions pertaining to this document, please contact CORNER INDUSTRIES, your project engineer.
P.O. Box 808
Oklahoma, Iowa 52577
800/825-8020 ext. 2153
DATE: 05/23/18

This symbol represents the 0.0 point for locating poles.
This field uses a 20' x 20' grid.
This field has a 60' baseball.
SOFTBALL FIELD: 324'/378'/436'
FIELD ID: Baseball

The following poles ECE's will have spare fuses: A1

Poles P1-P4 are donated from project #157610 to

become poles A1, A2, B1, B2

Fixtures 1-40 are donated from project #157610

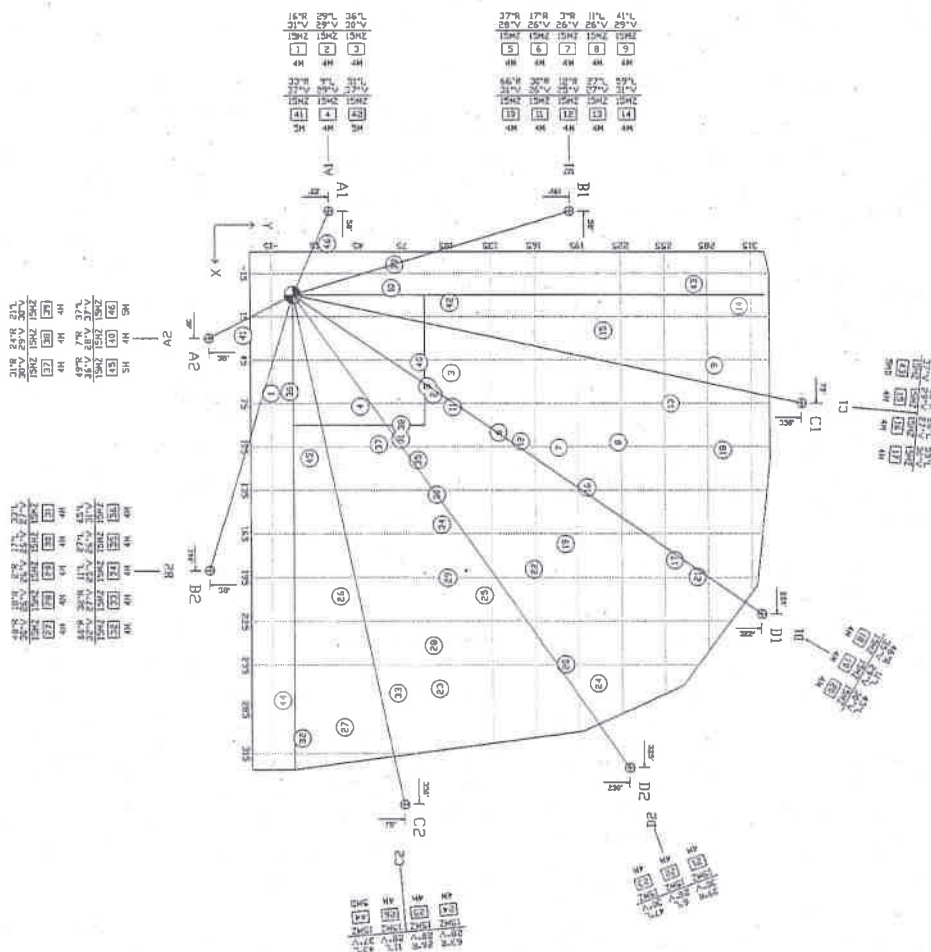
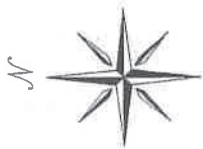
AIMING LEGEND



Align weld marks located at bottom of pole sections @ 0°(FIELD SIDE)

0 60' 120'
SCALE: 1 inch = 60'

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**MY PROJECT**

Name: Madison Memorial High School
Location: Madison, WI

Pole / Fixture Summary

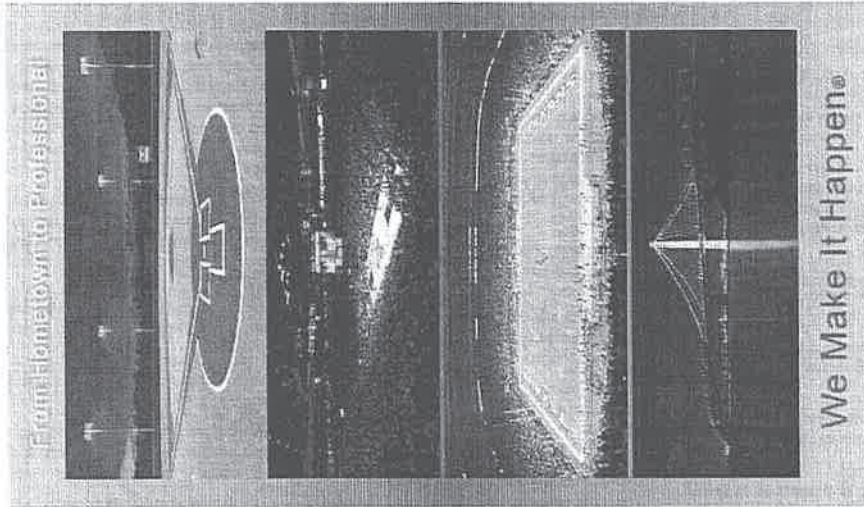
Pole ID	Pole Height	Fixture Qty	Lamp Type	Circuit
A1	80'	6	1500W MZ	B
A2	80'	6	1500W MZ	B
B1	80'	10	1500W MZ	B
B2	80'	10	1500W MZ	B
C1	80'	4	1500W MZ	B
C2	80'	4	1500W MZ	B
D1	80'	3	1500W MZ	B
D2	80'	3	1500W MZ	B
8		46		

Calculation Grid Summary

Grid Name	Calculation Metric	Type	Ave	Min	Max	Max/Min	Uniformity	Ave/Min	Circuits	Fixture Qty
Baseball (Infield)	Horizontal Illuminance	Constant	51	36	60	1.66		1.41	B	46
Baseball (Outfield)	Horizontal Illuminance	Constant	30.9	22	45	2.08		1.42	B	46

Circuit Summary

Circuit	Description	Load	Fixture Qty
B	Baseball	71.94 kW	46

**ENGINEERED DESIGN**

By: Connor Ramstead
File # / Date: 163423-p-5B3

18-Jun-18

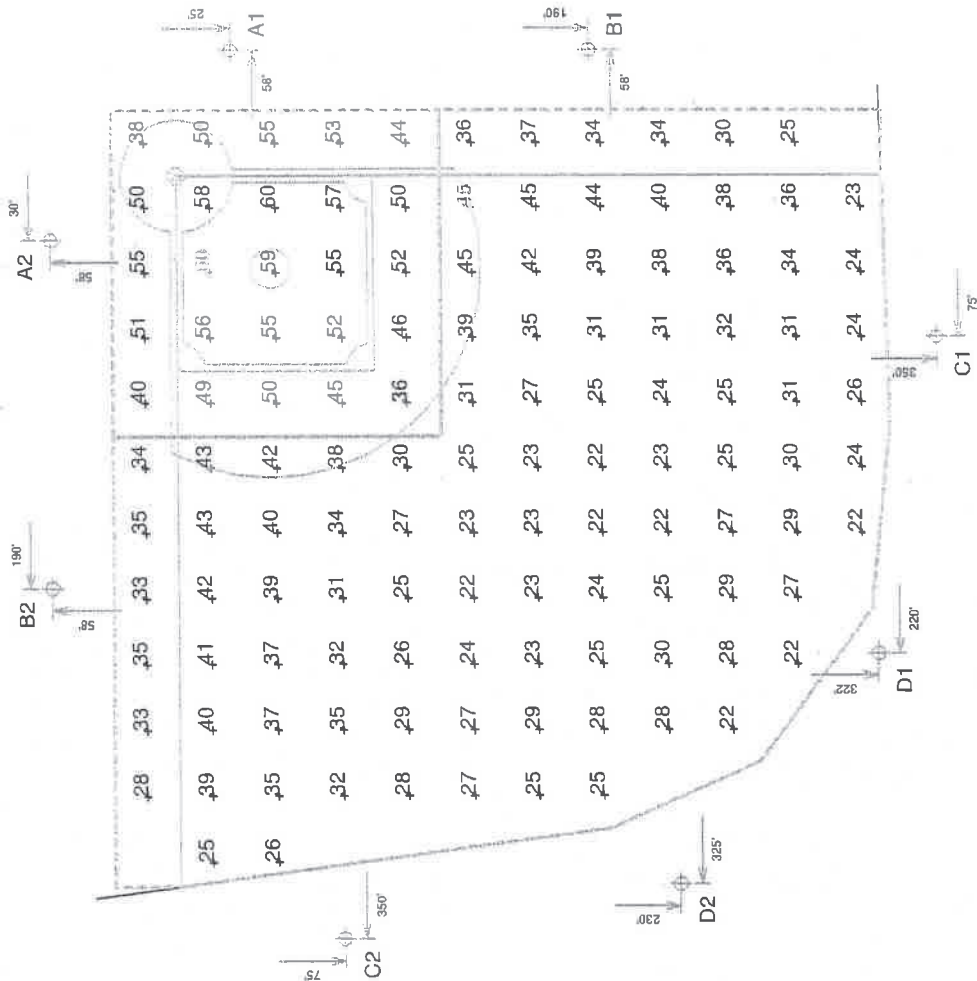
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PROJECT SUMMARY



EQUIPMENT LIST FOR AREAS SHOWN

QTY	LOCATION	SIZE	GRADE ELEVATION	MOUNTING HEIGHT	Luminaires			THIS GRID	OTHER GRIDS
					LAMP TYPE	QTY / POLE	QTY / GRID		
2	A1-A2	80"	-	80'	1500W MZ	6	6	6	0
2	B1-B2	80"	-	80'	1500W MZ	10	10	10	0
2	C1-C2	80"	-	80'	1500W MZ	4	4	4	0
2	D1-D2	80"	-	80'	1500W MZ	3	3	3	0
8	TOTALS					46	46	46	0



SCALE IN FEET 1 : 80



Pole location(s) ⊕ dimensions are relative to 0,0 reference point(s) ⊗

MY PROJECT

Name: Madison Memorial High School
Location: Madison, WI

GRID SUMMARY

Name: Baseball
Size: Irregular 324' / 379' / 326'
Spacing: 30.0' x 30.0'
Height: 3.0' above grade

CONSTANT ILLUMINATION

SUMMARY		HORIZONTAL FOOTCANDLES	
Guaranteed Average:	50	Infield	Outfield
Scan Average:	50.96		30.85
Maximum:	60		45
Minimum:	36		22
Avg / Min:	1.41		1.42
Guaranteed Max / Min:	1.66		2.08
Max / Min:	1.32		1.56
UG (adjacent pts):	25		100
No. of Points:	25		
LUMINAIRE INFORMATION			
Luminaire Type:	Green Generation		
Design Usage Hours:	5,000 hours		
Design Lumens:	134,000		
Avg Lamp Tilt Factor:	1.000		
No. of Luminaires:	46		
Avg KW:	71.94 (78.2 max)		

Guaranteed Performance: The Guaranteed Average CONSTANT ILLUMINATION described above is guaranteed for the design usage hours of the system.

Field Measurements: Illumination measured in accordance with IESNA RP-6-15 and CIBSE LG4. Individual values may vary. See the Warranty document for details.

Electrical System Requirements: Refer to Amperage Draw Chart and/or the "Musco Control System Summary" for electrical sizing.

Installation Requirements: Results assume +/- 3% nominal voltage at line side of the ballast and structures located within 3 feet (1m) of design locations.

ENGINEERED DESIGN

By: Connor Ramstead
File # / Date: 163423-p-5B3

18-Jun-18

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ILLUMINATION SUMMARY

**MY PROJECT**

Name: Madison Memorial High School
Location: Madison, WI

EQUIPMENT LAYOUT**INCLUDES:**

- Baseball

Electrical System Requirements: Refer to Amperage Draw Chart and/or the "Musco Control System Summary" for electrical sizing.

Installation Requirements: Results assume +/- 3% nominal voltage at line side of the ballast and structures located within 3 feet (1m) of design locations.

EQUIPMENT LIST FOR AREAS SHOWN

QTY	LOCATION	SIZE	GRADE ELEVATION	MOUNTING HEIGHT	Luminaires		
					LAMP TYPE	QTY / POLE	POLE
2	A1-A2	80'	-	80'	1500W MZ	6	6
2	B1-B2	80'	-	80'	1500W MZ	10	10
2	C1-C2	80'	-	80'	1500W MZ	4	4
2	D1-D2	80'	-	80'	1500W MZ	3	3
TOTALS						46	

SINGLE LUMINAIRE AMPERAGE DRAW CHART

Ballast Specifications (50 min power factor)	Line Amperage Per Luminaire (max draw)					
Single Phase Voltage	208 (vol)	220 (vol)	240 (vol)	277 (vol)	347 (vol)	480 (vol)
1500 watt MZ	8.6	8.3	7.5	6.5	5.1	4.7
					3.7	

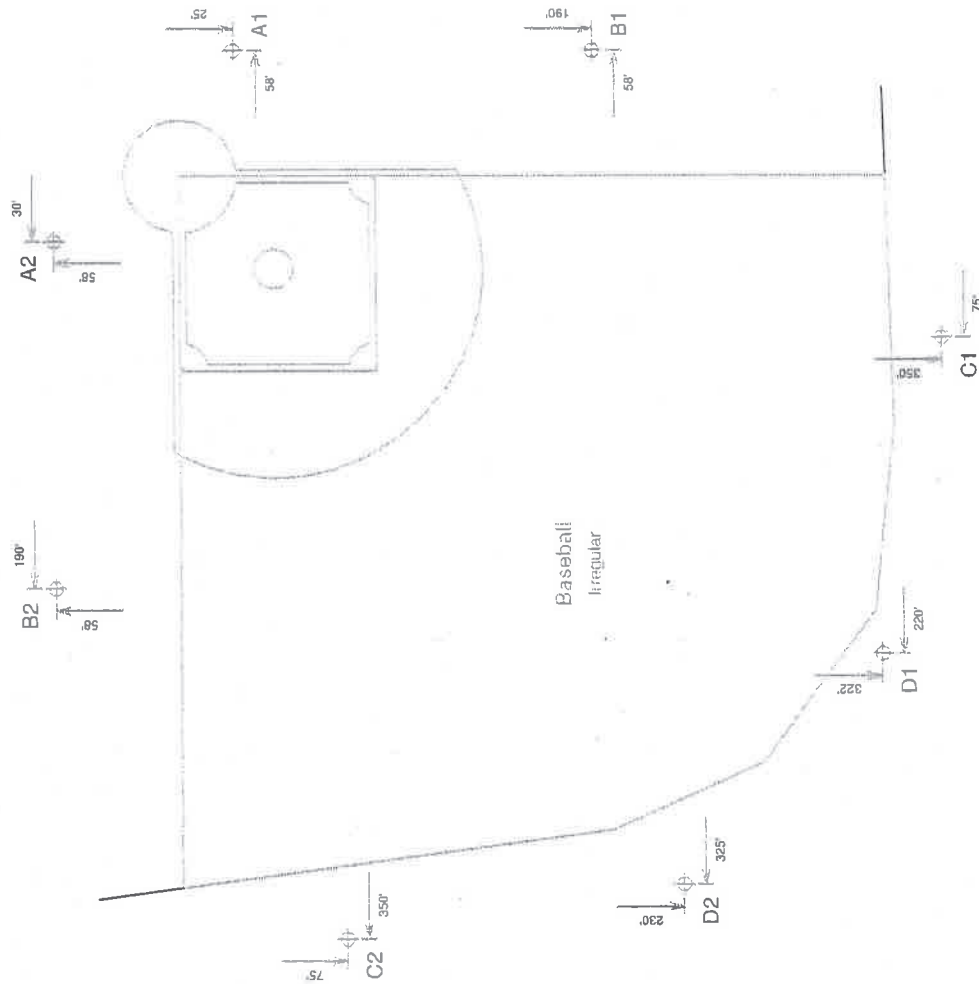
ENGINEERED DESIGN

By: Connor Ramstead

File # / Date: 163423-p-583

18-Jun-18

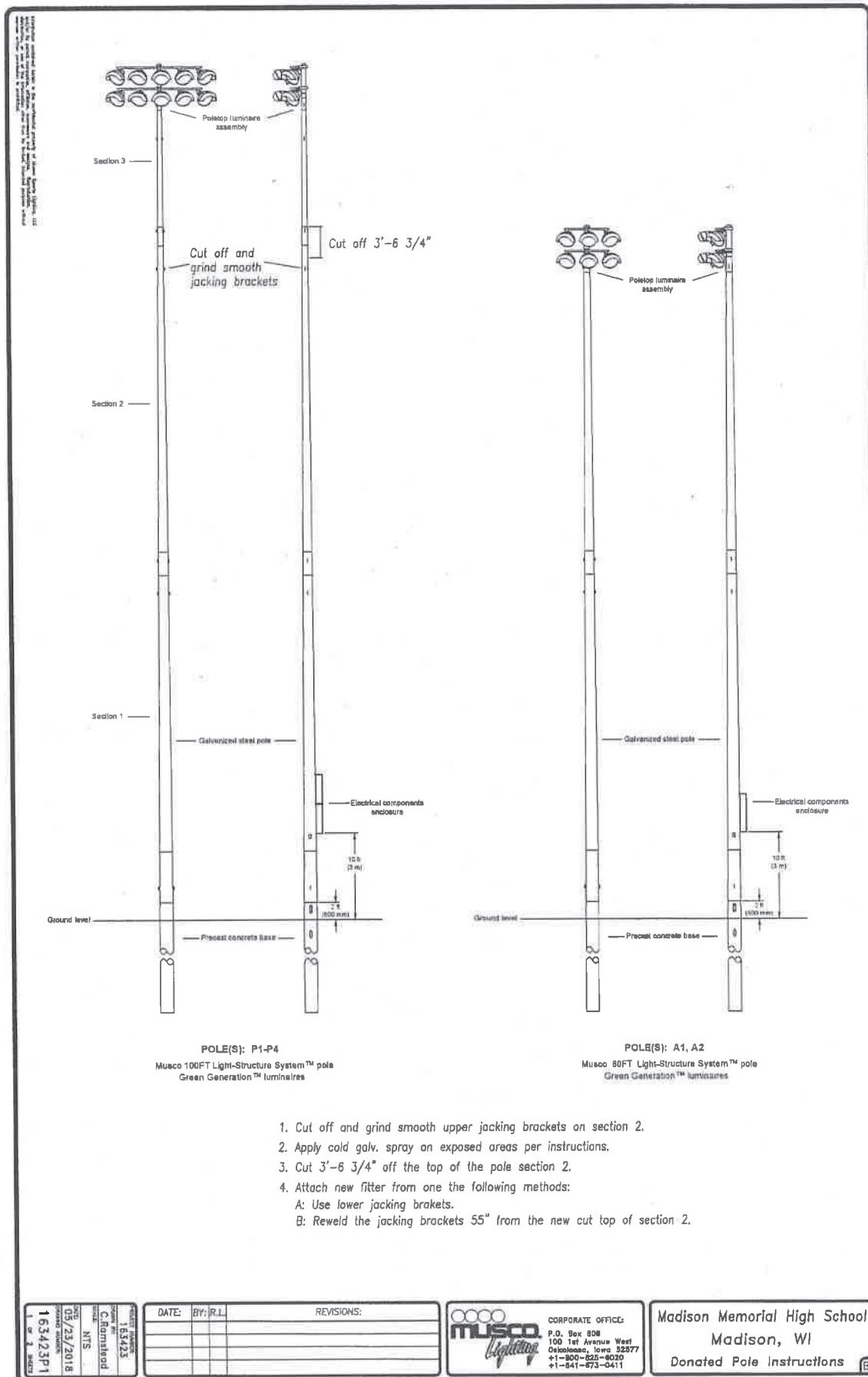
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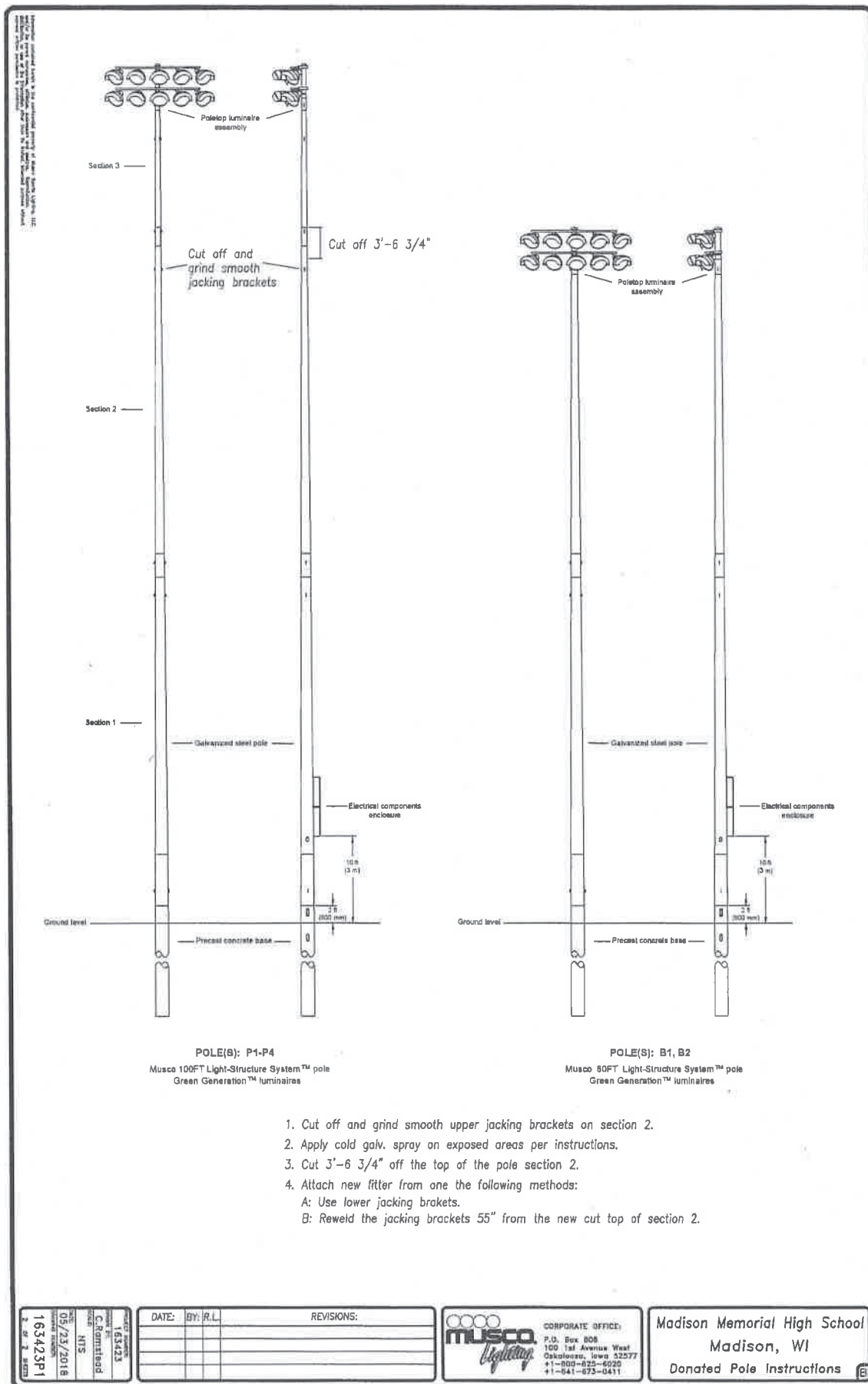
EQUIPMENT LAYOUT

Pole location(s) Ⓢ dimensions are relative to 0.0 reference point(s) ⊗

SCALE IN FEET 1 : 80







PRELIMINARY FOUNDATION AND POLE ASSEMBLY DRAWING

TABLE 1: POLE ASSEMBLY

POLE ID	POLE HEIGHT ft (m)	# OF LUMINAIRES	ASSEMBLED POLE WEIGHT lb (kg)
A1	80 (24.4)	8	3113 (1412)
A2	80 (24.4)	6	3113 (1412)
B1	80 (24.4)	10	3473 (1575)
B2	80 (24.4)	10	3473 (1575)
C1	80 (24.4)	4	2089 (952)
C2	80 (24.4)	4	2089 (952)
D1	80 (24.4)	3	1651 (749)
D2	80 (24.4)	3	1651 (749)
F1	80 (24.4)	13	4185 (1898)
F2	80 (24.4)	13	4185 (1898)
F3	80 (24.4)	15	4433 (2011)
F4	80 (24.4)	15	4433 (2011)

Pole Assembly Notes:

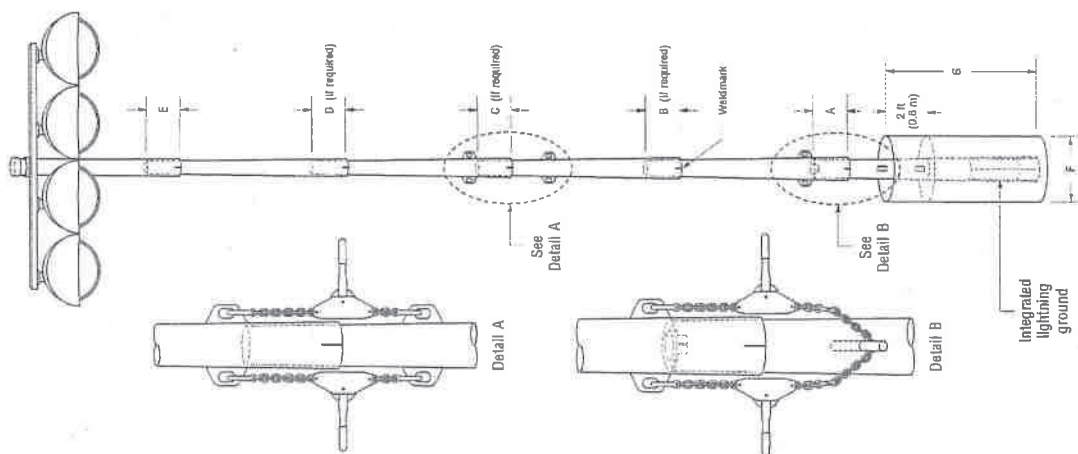
1. Steel pole should overlap concrete base and be sealed light with 1 1/2 ton core-along (contractor provided).
2. Align weldmarks on steel sections before assembling.
3. Assembled pole weight includes steel sections, crossarms, luminaires, and electrical components enclosures.
4. Section overlap must be pulled together until tight. Overlap measurement should be $\pm 1/8$ in (1.50 mm).
5. This document is not intended for use as an assembly instruction. See *Installation Instructions - Light Structure System™ Lighting System* for complete assembly procedure.

TABLE 2: FOUNDATION DETAILS

POLE ID	CONCRETE BASE WEIGHT lb (kg)	F ft (m)	BURIAL INFORMATION ^{1,2} CONCRETE BACKFILL ^{1,2} yd (m³)	CUT BASE NO	LIGHTING GROUND ³ SUPPLEMENTAL TYPE INSTRUCTION
A1	5300 (2404)	30 (762)	16 (4.9)	NO	INTEGRATED ⁴ N/A
A2	5300 (2404)	30 (762)	16 (4.9)	NO	INTEGRATED ⁴ N/A
B1	5300 (2404)	30 (762)	16 (4.9)	NO	INTEGRATED ⁴ N/A
B2	5300 (2404)	30 (762)	16 (4.9)	NO	INTEGRATED ⁴ N/A
C1	3810 (1728)	30 (762)	14 (4.3)	NO	INTEGRATED ⁴ N/A
C2	3810 (1728)	30 (762)	14 (4.3)	NO	INTEGRATED ⁴ N/A
D1	2760 (1261)	30 (762)	12 (3.7)	NO	INTEGRATED ⁴ N/A
D2	2760 (1261)	30 (762)	12 (3.7)	NO	INTEGRATED ⁴ N/A
F1	5300 (2404)	30 (762)	16 (4.9)	NO	INTEGRATED ⁴ N/A
F2	5300 (2404)	30 (762)	16 (4.9)	NO	INTEGRATED ⁴ N/A
F3	5300 (2404)	30 (762)	16 (4.9)	NO	INTEGRATED ⁴ N/A
F4	5300 (2404)	30 (762)	16 (4.9)	NO	INTEGRATED ⁴ N/A

Foundation Notes:

1. Concrete backfill is calculated to 2 ft (0.6m) below grade (no average included). Top 2 ft (0.6m) to be class 5 soil compacted to 95% density of surrounding undisturbed soil unless otherwise specified in stamped structural design.
2. Concrete backfill required 3000 lb/in² (20 MPa) minimum.
3. Foundation design per 2009 IBC, 90 mph exposure category C, variation STD.
4. Assumes IBC class 5 soil.
5. Standard bases include integrated lightning protection. If bases are cut, supplemental lightning protection is required. Contact Musco for materials and instructions.
6. Lightning protection is a manufacturer installed concrete encased electrode and connector. Ground connection is made when concrete base is installed and footing is poured. No additional steps required.



R60-80-00_A

Musco Metal Fabricating, LLC	Scale: N/A
Date: 01/28/2019	Page: 1 of 1
Rev: 01/28/2019	Project: 18-022
Project: 18-022	Project: 18-022



Control System Summary

Project Specific Notes:

Project Information

Project #: 163423
 Project Name: Madison Memorial High School SO SB FB
 Date: 05/24/18
 Project Engineer: C Ramstead
 Sales Representative: Greg Smidt
 Control System Type: Control and Monitoring
 Communication Type: Digital Cellular
 Scan: 163423-p-SB1, 163423-p-FB
 Document ID: 163423P3V1-0524093230
 Distribution Panel Location or ID: Service FB
 Total # of Distribution Panel Locations for Project: 2
 Design Voltage/Hertz/Phase: 480/60/3
 Control Voltage: 120

Equipment Listing

DESCRIPTION	APPROXIMATE SIZE	
1. Control and Monitoring Cabinet	24 X 48	
	QTY	SIZE
Total Contactors	4	30 AMP
Total Off/On/Auto Switches:	1	

Materials Checklist

Contractor/Customer Supplied:

- ☐ A single control circuit must be supplied per distribution panel location.
 - If the control voltage is NOT available, a control transformer is required.
- ☐ Electrical distribution panel to provide overcurrent protection for circuits
 - Thermal/Magnetic circuit breaker sized per full load amps on Circuit Summary by Zone Chart
- ☐ Wiring:
 - Dedicated control power circuit
 - Power circuit to and from lighting contactors
 - Harnesses for cabinets at remote locations
 - Means of grounding, including lightning ground protection
- ☐ Electrical conduit wireway system
 - Entrance hubs rated NEMA 4: must be die-cast zinc, PVC, or copper-free die-cast aluminum
- ☐ Mounting hardware for cabinets
- ☐ Control circuit lock-on device to prevent unauthorized power interruption to control power
- ☐ Anti-corrosion compound to apply to ends of wire, if necessary

Call Control-Link Central™ operations center at 877/347-3319 to schedule activation of the control system upon completion of the installation.
 Note: Activation may take up to 1 1/2 hours

IMPORTANT NOTES

- Please confirm that the design voltage listed above is accurate for this facility. Design voltage/phase is defined as the voltage/phase being connected and utilized at each lighting pole's ballast enclosure disconnect. Inaccurate design voltage/phase can result in additional costs and delays. Contact your Musco sales representative to confirm this item.
- In a 3 phase design, all 3 phases are to be run to each pole. When a 3 phase design is used Musco's single phase luminaires come pre-wired to utilize all 3 phases across the entire facility.
- One contactor is required for each pole. When a pole has multiple circuits, one contactor is required for each circuit. All contactors are UL 100% rated for the published continuous load. All contactors are 3 pole.
- If the lighting system will be fed from more than one distribution location, additional equipment may be required. Contact your Musco sales representative.
- A single control circuit must be supplied per control system.
- Size overcurrent devices using the full load amps column of the Circuit Summary By Zone chart. Minimum power factor is 0.9.

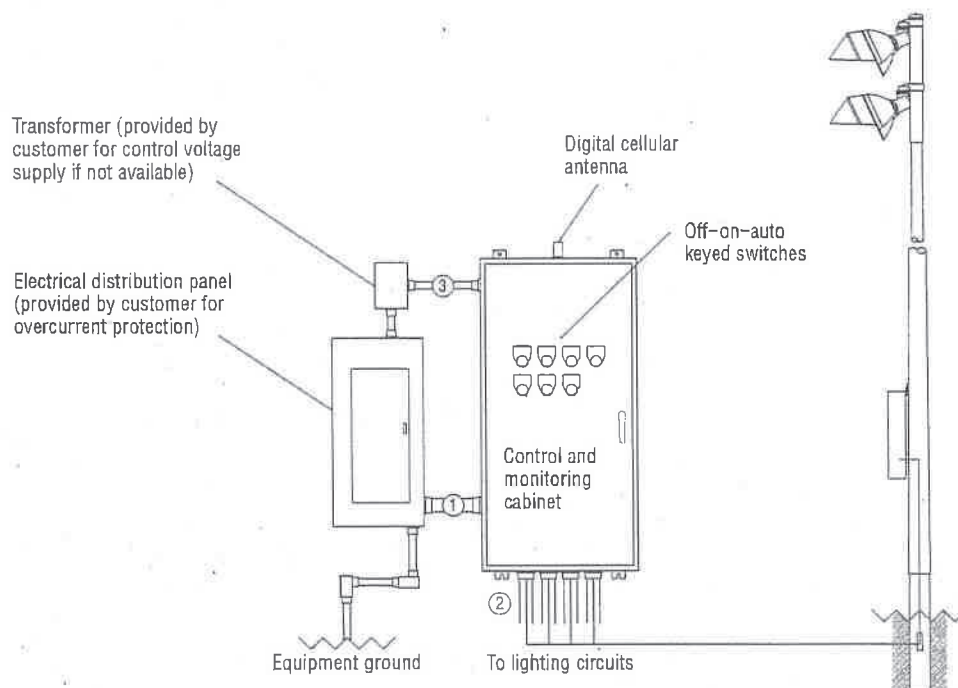
NOTE: Refer to Installation Instructions for more details on equipment information and the installation requirements



Control System Summary

Madison Memorial High School SO SB FB / 163423 - 163423-p-FB
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Control-Link. Control and Monitoring System



Wire	Description	# of Wires	Typ. Wire Size (AWG)	Max. Wire Length (FT)	Wire from Musco	Notes
1	Line power to contactors, and equipment grounding conductor	Note A	Note B	27	No	A - E
2	Load power to lighting circuits	Note A	Note B	N/A	No	A - D
3	Control power (dedicated, 20A)	3	12	N/A	No	C, D

R60-32-00_C

- Notes:
- A. Voltage and phasing per the notes on cover page.
 - B. Calculate per load and voltage drop.
 - C. All conduit diameters should be per code.
 - D. Refer to control and monitoring system installation instructions for more details on equipment information and the installation requirements.
 - E. Contact Musco if maximum wire length from circuit breaker to contactor exceeds value in chart.

IMPORTANT: Control (3) wires must be in separate conduit from line and load power wiring (1, 2).



Control System Summary

Madison Memorial High School SO SB FB / 163423 - 163423-p-FB
Service FB - Page 3 of 8

SWITCHING SCHEDULE

Field/Zone Description	Zones
Football	1

CONTROL POWER CONSUMPTION	
120V Single Phase	
VA loading of Musco Supplied Equipment	INRUSH: 1568.0
	SEALED: 194.8

CIRCUIT SUMMARY BY ZONE							
POLE	CIRCUIT DESCRIPTION	# OF FIXTURES	# OF DRIVERS	*FULL LOAD AMPS	CONTACTOR SIZE (AMPS)	CONTACTOR ID	ZONE
F1	Football	13	13	21.7	30	C1	1
F2	Football	13	13	21.7	30	C2	1
F3	Football	15	15	22.9	30	C3	1
F4	Football	15	15	22.9	30	C4	1

*Full Load Amps based on amps per driver.



Control System Summary

Madison Memorial High School SO SB FB / 163423 - 163423-p-FB
Service FB - Page 4 of 8

PANEL SUMMARY						
CABINET #	CONTROL MODULE LOCATION	CONTACTOR ID	CIRCUIT DESCRIPTION	FULL LOAD AMPS	DISTRIBUTION PANEL ID (BY OTHERS)	CIRCUIT BREAKER POSITION (BY OTHERS)
1	1	C1	Pole F1	21.70		
1	1	C2	Pole F2	21.70		
1	1	C3	Pole F3	22.90		
1	1	C4	Pole F4	22.90		

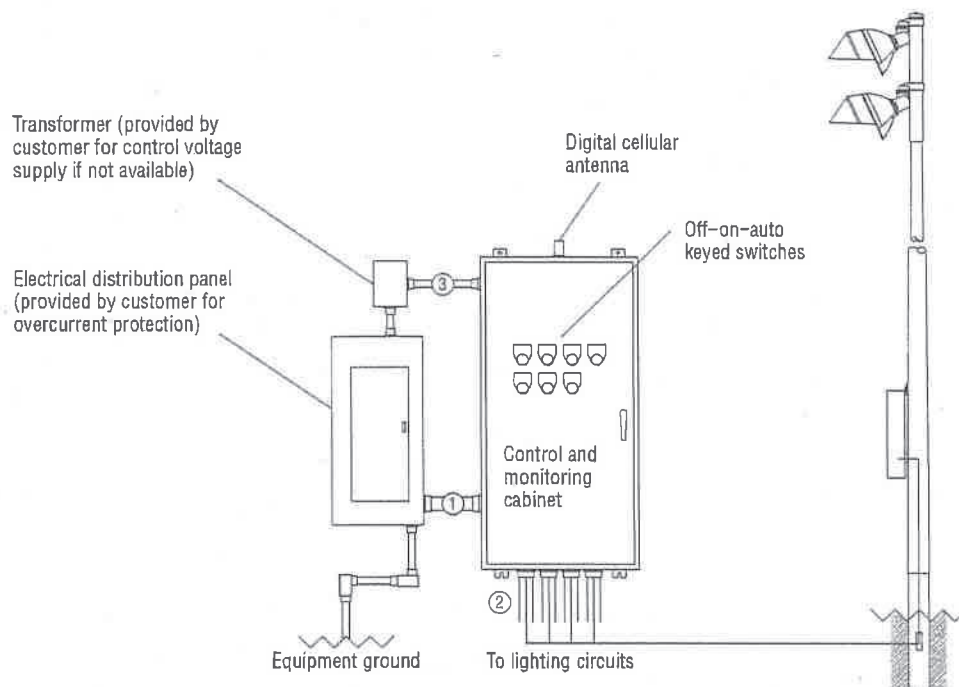
ZONE SCHEDULE				
ZONE	SELECTOR SWITCH	ZONE DESCRIPTION	CIRCUIT DESCRIPTION	
			POLE ID	CONTACTOR ID
Zone 1	1	Football	F1	C1
			F2	C2
			F3	C3
			F4	C4



Control System Summary

Madison Memorial High School SO SB FB / 163423 - 163423-p-SB1
Service BB - Page 6 of 8

Control-Link. Control and Monitoring System



Wire	Description	# of Wires	Typ. Wire Size (AWG)	Max. Wire Length (FT)	Wire from Musco	Notes
1	Line power to contactors, and equipment grounding conductor	Note A	Note B	27	No	A - E
2	Load power to lighting circuits	Note A	Note B	N/A	No	A - D
3	Control power (dedicated, 20A)	3	12	N/A	No	C, D

R60-32-00_C

- Notes:
- A. Voltage and phasing per the notes on cover page.
 - B. Calculate per load and voltage drop.
 - C. All conduit diameters should be per code.
 - D. Refer to control and monitoring system installation instructions for more details on equipment information and the installation requirements.
 - E. Contact Musco if maximum wire length from circuit breaker to contactor exceeds value in chart.

IMPORTANT: Control (3) wires must be in separate conduit from line and load power wiring (1, 2).



Control System Summary

Madison Memorial High School SO SB FB / 163423 - 163423-p-SB1
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SWITCHING SCHEDULE

Field/Zone Description	Zones
Baseball	1

CONTROL POWER CONSUMPTION	
120V Single Phase	
VA loading of Musco Supplied Equipment	INRUSH: 2548.0 SEALED: 298.8

BALLAST SPECIFICATIONS .90 Minimum Power Factor	VOLTAGE: 480v THREE PHASE						
BALLAST OPERATING VOLTAGE	208	220	240	277	347	380	480
1500 Watt Metal Halide Lamp Operating line amperage per fixture- maximum	8.6	8.3	7.5	6.5	5.1	4.7	3.7
1000 Watt Metal Halide Lamp Operating line amperage per fixture- maximum	6.5	6.4	5.8	4.9	4.0	3.6	2.9

CIRCUIT SUMMARY BY ZONE						
POLE	CIRCUIT DESCRIPTION	# OF FIXTURES	FULL LOAD AMPS	CONTACTOR SIZE (AMPS)	CONTACTOR ID	ZONE
A1	Baseball	6	14.8	30	C1	1
A2	Baseball	6	14.8	30	C2	1
B1	Baseball	10	25.9	30	C3	1
B2	Baseball	10	25.9	30	C4	1
C1	Baseball	4	11.1	30	C5	1
C2	Baseball	4	11.1	30	C6	1
D1	Baseball	3	7.4	30	C7	1
D2	Baseball	3	7.4	30	C8	1



Control System Summary

Madison Memorial High School SO SB FB / 163423 - 163423-p-SB1
Service BB - Page 8 of 8

PANEL SUMMARY						
CABINET #	CONTROL MODULE LOCATION	CONTACTOR ID	CIRCUIT DESCRIPTION	FULL LOAD AMPS	DISTRIBUTION PANEL ID (BY OTHERS)	CIRCUIT BREAKER POSITION (BY OTHERS)
2	2	C1	Pole A1	14.80		
2	2	C2	Pole A2	14.80		
2	2	C3	Pole B1	25.90		
2	2	C4	Pole B2	25.90		
2	2	C5	Pole C1	11.10		
2	2	C6	Pole C2	11.10		
2	2	C7	Pole D1	7.40		
2	2	C8	Pole D2	7.40		

ZONE SCHEDULE				
ZONE	SELECTOR SWITCH	ZONE DESCRIPTION	CIRCUIT DESCRIPTION	
			POLE ID	CONTACTOR ID
Zone 1	1	Baseball	A1	C1
			A2	C2
			B1	C3
			B2	C4
			C1	C5
			C2	C6
			D1	C7
			D2	C8

